

## THE BIG PICTURE – WELTE'S INSTRUMENTS, ROLLS, RECORDING, DIGITAL EDITING

The Welte Philharmonie – or Philharmonic to most English-speakers – was an ingenious musical instrument. Its origins lay in both the pneumatics and acoustics of the ancient Greeks, to say nothing of their mechanics, hydraulics or music. In the 20<sup>th</sup> century, both the “Phil”, as it is affectionately known in some circles, and aeronautical engineering, brought human arts and sciences of using air to their zenith. Pneumatic organ actions were then transformed to electric actions although there was a later reaction back to mechanics. For the aviation industry it was seminal: aircraft now replaced steam engines and organs as the most complex technology known to civilisation.

The many ages and stages between the ancient Greeks, and Welte's early 20<sup>th</sup> century automatic instruments, produced a train of incremental invention. Each epoch found ways of making organs play and sound the way it wanted them to. That changed with every new aesthetic from gothic, renaissance, baroque, “neo-classical” late 18<sup>th</sup> century, through the romantic era and on to a second, “neo-classical” phase, in the 20<sup>th</sup> century. It differed from country to country, culture to culture, even language to language: whether French, German, Italian, English or Netherlands, organs were also expressions of national ethos.

By the early 19<sup>th</sup> century, the means of controlling the aesthetic qualities of organ pipes had long been established by empirical means: if it sounded good, then that was the way it was done. Sounding good, of course, differed according to whether you were a medieval Netherlander, a renaissance Spaniard, a baroque Saxon, or your language and culture were “classical” French. After the industrial revolution there were changes in tonal concepts as more scientific approaches led to a greater variety of tonal resources through new pipe technologies. Organ stop-lists and playing actions tended then towards a conformity.

The one thing that was more or less universal, was that “bigger was better”. This has usually been the case with organs: once smaller versions of a particular type have been established, the larger follow. So organs grew in size to and through the 19<sup>th</sup> century. The orchestrion also grew in size as time went on until it became the Philharmonie.

### From Orchestrion to Philharmonie

The first device to bear the name “Orchestrion” dates back to around 1784–1809 with “Abbé” Georg Joseph Vogler (1749–1814). The Welte firm, amongst others, later specialized in the development and manufacture of orchestrions from early 19<sup>th</sup> century to mid-20<sup>th</sup>. Their instruments also became ever larger. Contemporary organ pipe technology was mostly adopted by the firm, notably in their string and flute registers – the Wienerflöte, common to orchestrion and Philharmonie, was one example. Some of the reeds remained more traditional, even



Fig. 1 – Welte Orchestrion Cottage No. 2 in a sales catalogue of the company

“classical”: the Vox Humana for instance, or their Oboes, could both be cited. Yet the specifications retained an empirical approach.

A central design tenet of orchestrions was to serve orchestral transcriptions. They filled an existing void between supply and demand of orchestras. Playing transcriptions was later to become a specialized skill of some of Welte’s best organists. So when the Philharmonie was on the drawing boards, Welte simply took an orchestrion and moved its concept a step or two further: they made it larger and more capable of imitating orchestras than ever before. They added a keyboard, stops and pedals so that it could also be played as an organ.

The next step was to design and build a device which enabled organists playing “live” to be recorded for posterity. This took time and ran behind schedule, hardly surprising in such a complex pioneering endeavor. Technology and art combined here in a remarkable synthesis which won exhibition prizes and created global interest. It also propagated seemingly endless patents. As these developments became known, White Star Line had hoped to have one aboard Titanic. But time ran out. Britannic was next off the slips and in good time.

## Recording live performances

After their success with piano recordings, Welte unveiled plans for their “Welte-Philharmonie-Autograph-Organ” which, by 1909, was a prototype of their recording organ in Freiburg. At the major exhibitions there was usually a Welte presence. The Philharmonie, the “playback organ”, began to be unveiled and was declared fully functioning, the firm now ready to take orders, at the Turin exhibition of 1911. Welte’s first official recording organist, Marco Enrico Bossi played in a concert on the final day of this exhibition.

Along with the Philharmonie itself there was the need for it to play rolls specially designed for its new technology, including tracker-bars with 150 holes. Here it seems that the firm was also behind schedule: the dedicated recording organ had to be fully developed, its ingenious but very complex hybrid pneumatic-electric systems brought to technical perfection. Time was needed – it must have been three extraordinary years at the firm’s base in Freiburg from the prototype to Bossi’s epoch-making recording session in July 1912. That date was after Turin and after the Titanic had sailed and sunk. By then Britannic’s organ was being prepared for delivery to Belfast. Tunbridge Wells was soon to be installed. Rolls were needed.

(A) The forward entrance to have a vestibule F & S at the after end of it; also an Aeolian Organ with two chests for music rolls; 7 settees and 10 chairs. An after entrance to be entered direct from the deck F & S and to have two settees and 10 chairs. Six electric heaters to be arranged as shown on the approved design.

Fig. 2 – The original plan was to have an Aeolian player-organ aboard Britannic – clearly the prestige of the new and ever so much grander, Philharmonie won out



Fig. 3 – The Freiburg recording organ in late August 1913 with British organist William Wolstenholme

The earliest dates so far found on master rolls are two from 1911, the first just before the exhibition: there are markings on a hand-punched roll of selections from Rossini’s William Tell (Welte No. 482) which state: “fertig 9.3.11 Broeckel” (“finished ... by K. Broeckel”). Later was added “neuen Schluss gemacht 11.3.12” (“new ending made...”), and a pink routing slip is preserved with the master showing that a copy was made for a “Frl Rieger 18.3.29”. This roll certainly would have been an excellent choice to play at Turin – one of Rossini’s most popular operas, immediately attractive – and so very Italian. It was a potpourri and followed another which was already issued with the Overture. Both run the gamut of Welte’s excellence in every way – the effects, crescendos, repetitions, “orchestration”, are truly amazing for 1911. The second roll takes around 11 minutes to play, exists also as an orchestrion roll,



The only still-existing Welte organ recorder is now also in the possession of the Seewen Museum. It came from the New York branch of the firm.

and seems to have been specially made for Turin. These demonstrations must have given the neighbouring exhibitors heart attacks. No wonder Welte was awarded prizes in such abundance if this is what was played. Just after the exhibition concluded we find another with a 1911 inscription stating it was finished on 30.11.11 (again by Broeckel) and that Franz had altered the “Crescendo” (Swell). This was Welte No. 730, Rubinstein’s *Wanderers Nachtlied*. If nothing else these two rolls demonstrate that the technology was already working well.

You could not, however, record on a Philharmonie. That needed a specialized installation. The only still-existing Welte organ recorder is now also in the possession of the Seewen Museum. It came from the New York branch of the firm.

### Tributes to the arts of M. Welte, Fr. Franz and the “perforation performers”

The surviving Welte rolls and catalogues convey much useful information. The master rolls, which by a near miracle are preserved almost in their entirety at Seewen, are especially important since they

bear important clues: artists’ signatures, time-stamps, details of editing.

With these we might tentatively reconstruct those early days of Philharmonie roll-production. Given that 9<sup>th</sup> March 1911 is the earliest date found on a roll, and that roll being Welte No. 482, we can look at the numbers before this and assume that they preceded this date chronologically. To all intents and purposes this seems a fair assumption based on investigations so far. 111 titles look like they were former orchestration roll conversions or newly hand-perforated,<sup>1</sup> 12 were converted from existing piano rolls, and 14 were original organist-recordings. Some of these 139 known early rolls do not readily allow classification and these figures certainly need treating with caution. However, in broad percentages, 80% seem to have been ex-orchestration and/or newly hand-perforated, 9% piano roll conversions and 10% organist recordings. The remaining 1% is currently unable to be classified with certainty.

At the end of production at least 16% of known Philharmonie rolls remained those hand-perforated by Welte’s dedicated team of musician-technicians. The art of these people lay in creating performances by making millions of small holes in paper rolls instead of pressing levers activating piano or organ mechanisms. They knew how their music should sound, every nuance of it, and they knew how to make it sound that way through the medium of hand-perforated paper rolls.

The art of musical transcription was closely related to this, since the original works were often orchestral and the Philharmonie was born to play this genre. With the rolls that had their origins as piano roll performances the musician-technician’s art of transcription was mainly one of orchestration through registration and a few details made more suitable for organ (e.g. suppression of arpeggiandi, lengthening of bass notes transferred to pedal).

This took 18<sup>th</sup> century organ transcription practices and drove them towards a new breed of mid-19<sup>th</sup> and early 20<sup>th</sup> century organists who specialized in playing this niche repertoire. It became very important to the entertainment environment of that era, not least the movie industry.

Many of the master-rolls at Seewen bear comments such as “converted 10–150”, or “Umgest. von Orch. 10” (reperforated from Orchestration 10), or just “150” scribbled on their lead-ins. This seems to refer to a transfer from orchestration rolls, designed for 120-note tracker-bars, to the Philharmonie 150-note standard. Inevitably such performances could only

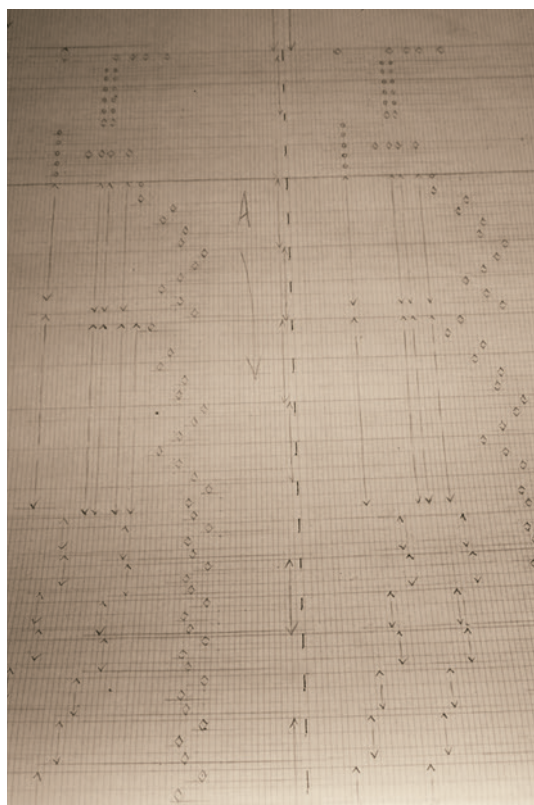


Fig. 4 – A hand-perforated roll in preparation

have been hand-perforated. Some of them are identified with “M. Welte” as either “performer” or arranger, and even more, “Fr. Franz”. Many bear no identification of this kind at all.

Most hand-perforated rolls were made by masters of their craft. They demonstrate an impressive ability to make “mechanical” music sound like true performance. The musical spirit of the era (e.g. Verdi, Masscagni), as well as that of earlier eras (Beethoven, Mozart) is well-captured with their skill in turning perforations into performances. Identification of the musician-technician is, however, difficult in the case of the rolls where no “arranger” is mentioned. Named or not, their excellence shows them to be as much technicians as musicians, performers in their own metier. They read from scores but their “instrument” was paper roll and hole-punch: we might call them “perforation performers”.

The Welte Cottage Orchestrion was in production from around 1892 when it was first exhibited at the Chicago World’s Fair. This signalled one of the final moments when paper rolls took over from pinned barrels and earlier technologies.<sup>2</sup> Roll-repertoire must have been urgently needed. Whether or not Beethoven and Wagner formed part of this in Chicago is unclear, but the product being German, the national musical wares would most likely have included these names amongst others. No doubt the firm soon came to know the repertoire that sold best, and which titles were destined to become the future favourites – especially on the bigger and better instruments represented by the Concert Orchestrions or Philharmonie. Although there was a common core, there were differences between the USA and Europe, as the available catalogues and databases attest.<sup>3</sup> The European Philharmonie and USA Philharmonic were also based on slightly differing concepts.

Thus, by 1890, there must have been a pressing need to produce rolls of standard repertoire: hymns, evergreens, operetta and popular music of the day. The extant catalogues endorse this and cover all these styles of music. For the later orchestrions and the Philharmonie the firm had to invest in roll-repertoire. Opinions vary as to how this was done. But whether manually-copied or machine-converted, expensive recreation of items that already played and sold well must have been kept to a minimum.<sup>4</sup> This so far appears to have been the case with all conversions to “150”-marked Philharmonie master rolls mentioned above.

There is no certainty about when most of the hand-perforated rolls were actually made. All that is known is that some new rolls, and others converted

to Philharmonie formats, began to appear from 1911 as the new instrument came on line. The conversions constitute an almost identical core repertoire to virtually all earlier orchestrion rolls. The Philharmonie was so successful that there were over 20 known installations between 1912 and 1914. Rolls were urgently needed since most of the owners were not organists.

“M. Welte” and “Fr. Franz” are identified closely with this work as their names are by far the most frequently seen. There were two Michael Weltes: father (1807–1880) and son (1846–1920). Few deserve the title of “master” in this context as well as “M. Welte”. But which one was it? The attributions were maintained on rolls issued long after their deaths. Michael Welte senior died in 1880 so it was very unlikely to have been him. This was three decades before the Philharmonie existed and well before the “Style 10 Cottage” made its debut.



Fig. 5 – Automatic Organ, built by Michael Welte 1845–1848



Michael Welte junior was aged about 36 by then. He continued to be employed until 1900 when he moved into the “technical running” of the firm. Then he took a back seat when Edwin Welte and Karl Bockisch entered as directors. He continued in this new rôle until he died in 1920. The Philharmonie and its main roll-releases cover a time-span of about 1912–1928. Around half the release dates of rolls bearing the name “M. Welte” as arranger are unknown. Those known run from 1912 to 1925. Yet 1925 was 5 years after the son’s death. That roll was Wagner’s *Tannhäuser Overture* – a very well-known orchestrion title from the 19<sup>th</sup> century. There were others, e.g. a *Tannhäuser March* released in 1923.

“Fr. Franz” was Franz Xaver Franz (1857–1920) who worked 1880–1920 as a chamber musician of the Freiburg City Orchestra – a trumpeter, with second instrument violin. Not known to have been an organist, he was also a Welte employee who probably began creating orchestrion rolls from the 1880s.<sup>5</sup> He clearly made many hand-perforated rolls or re-cut earlier ones to suit the new Philharmonie system. The quantity of hand-perforated rolls ascribed to Franz exceeds that of any other identified “arranger”. Their musical quality is remarkably high. The terminology applied by Welte can be agonizingly unhelpful: known release dates of the Philharmonie rolls ascribed to him as “arranger” are 1912–1927. This hints at his being already well experienced by 1912 and that the release dates were nothing to do with him being alive: they could have been cut at almost any stage from the 1880s to 1920.

An intriguing musicological question is thus conjured up: if these converted orchestrion rolls represent the performance practices of an earlier era than that of the Philharmonie around 1912–1928, then just how far back do they take us? To around 1900 when Michael Welte Junior stepped down from managing the firm? Was that because he was better employed for his skill in making these rolls sound as they do? Or to the 1880s when he, or Franz, or others started to create them for Welte’s move across to paper rolls?

Or even – at least in spirit if not in techniques – back to the 1850s when Michael Welte senior was pinning barrels? While it might take considerable bravery to even suggest that some of them go back to barrel organs, the point here is that experience with barrels must have backed up the creation of all rolls. The techniques of this had been detailed for over a century by 1880.<sup>6</sup> Throughout the 19<sup>th</sup> century this had been polished and perfected. There was never a better instrument to play rolls on than the

“Philharmonie”. Convincing performances did not just happen in 1912: there was almost 150 years of experience behind them.

With either of the Michael Weltes it concerns somebody born in the first half of the 19<sup>th</sup> century who learned musical performance paradigms very close to their sources. Franz Xaver Franz was only 11 years younger than Michael Welte II. The better he or “M. Welte” were at their craft, the more the heritage value of these rolls takes on importance in any quest for 19<sup>th</sup> century musical performance practice.

The culture of Beethoven, Mozart and Wagner was deeply ingrained in all of them, giving their musical interpretations a ring of authority. “M. Welte” must have been the son in every instance, but in the long run all lived close to the immediate post-Beethoven era and were immersed in the world of Wagner. The performance practices they represented were in any case pre-World War I, which seems to have been the watershed in this respect.<sup>7</sup>

There is a sequence of the Beethoven 5<sup>th</sup> Symphony, 1<sup>st</sup>, 3<sup>rd</sup> and 4<sup>th</sup> movements on separate rolls, all released in 1921. Harry Goss-Custard played the 2<sup>nd</sup> movement (undated roll) so the work is available complete. Probably the hand-perforated rolls were Franz’s work, but the identity of the “arranger” is not recorded. They are masterly productions, and, if it was Franz, then the performance traditions reflected here are by an experienced orchestral musician who had learned, known and played this repertoire, probably since before 1880.

There are many other works, including milestones such as Mozart’s *Overture to The Magic Flute* or Beethoven’s “Eroica” Symphony: whoever created them, the performance practice represented in them was far closer to Mozart and Beethoven than anything else ever likely to show up now. With Wagner it gets even closer: excerpts from *Rienzi* (first performed 1832), *Tannhäuser* (1845) and *Lohengrin* (1850) are three of the rolls attributed to “M. Welte” in this way. Many more look as if they were created by the same person: *Walküre*, *Parsifal*, *Götterdämmerung*, *Fliegende Holländer*. These were all in the standard repertoire while both Michael Weltes and Franz Franz were alive and in their prime.

The following table – an overview from available information – gives a general idea of the known rolls which either mention a “150” conversion, are attributed to “M. Welte” or “Fr. Franz”, or might otherwise be meaningful to this discussion.

Key (left to right): Welte Philharmonie roll No.; Composer’s surname; Title as given in the cata-

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logue or on the roll (generally given as Welte presented them); **Arranger** (Arranger in the normal musical sense? Transcriber? Perforator?); **Release date** the roll was released, if known.

\* indicates transferred from a piano roll  
**Bolded:** Known orchestrion rolls and thus titles common to orchestrions and organs.

Welte No.	Composer	Title	Arranger	Release
3	Adam	Si j'étais Roi – Overture		
10	Auber	Fra Diavolo, Overture	Franz	
11	Auber	Fra Diavolo, Selection I	Franz	
29	Beethoven	Leonore – Overture	Welte M.	
36	Beethoven	Leonore – Overture	Welte M.	
41	Beethoven	Eroica Symphony first movement	Welte M.	1915
43*	Beethoven	Sonate (Moonlight) 1. u. 2.	Franz	1924
44*	Beethoven	Sonate Cis mol 3. Satz	Franz	1924
45	Beethoven	Andante F dur	Franz	
53	Berlioz	Damnation de Faust Ballet des Sylphes	Franz	1923
54	Boccherini	Menuett	Franz	
61	Bizet	L' Arlesienne, Selection	Franz	
74	Cherubini	Requiem, Sanctus	Franz	
76	Brahms	Ungarischer Tanz No. 6 für Orgel	Franz	
93	Delibes	Sylvia, Ballet	Franz	
94	Delibes	Coppelia, Ballet	Franz	
107	Donizetti	Lucia De Lammermoor, Selection	Franz?	
117	Delibes	Coppelia Ballet	Franz	
142	Grieg	Peer Gynt: Morgenstimmung/Åsas Tod	Franz?	
159	Gounod	Faust, Ballet Part I	Franz	
162	Gounod	Romeo And Juliet, Selection	Franz	
170	Gounod	Faust, Waltz	Franz	
181	Handel	Largo	Franz	
197	Gounod	Faust, Selektion		1922
200	Gounod	Faust Ballet, Selection Part 1	Franz	
207	Gounod	Sanctus, arr. K. Mahlo	Mahlo	1921
213*	Grieg	Peer Gynt Morning, Åsa's Death	Franz	
216	Mascagni	Cavalleria Rusticana, Selection I	Franz	
243	Mendelssohn	Midsummer Night's Dream, Overture	Franz	
291	Leoncavallo	Bajazzo, 1. Teil		
294	Leoncavallo	Bajazzo, 4. Teil arr. Fr. Franz	Franz	1914
295	Leoncavallo	Bajazzo, 5. Teil (tutti und Pos.)	Franz?	1914
308	Mozart	The Magic Flute, Overture	Franz	
312	Mozart	Fantasy For An Organ Cylinder II	Franz	
338	Rossini	William Tell Overture	Franz	
339	Massenet	Scenes Pittoresques (Fete de Boheme)	Beck	
348	Rossini	Stabat Mater, Selection	Franz	
350	Mendelssohn	Ein Sommernachtstraum, Overture		
369	Schubert	Am Meer, A La Meer Songs	Franz	
379	Meyerbeer	Robert, der Teufel, Ballet, I. Teil		1914
381	Schumann	Träumerei (Kinderszenen, op. 15, No. 7)	Franz?	
410	Suppé	Poet And Peasant, Overture	Franz	
421	Mozart	Figaro's Hochzeit, Overture	Franz	1918
429	Mozart	Fantasie für eine Orgelwalze	Franz	1923

Welte No.	Composer	Title	Arranger	Release
442	Verdi	Aida, Act IV, Part 3	Franz	
447	Wagner	Rienzi Overture	Franz	
450	Wagner	Lohengrin, Introduction Bridal Chorus	Franz	
457	Wagner	Lohengrin, Selection IV	Franz	
469	Wagner	Parsifal, Vorspiel	Franz?	
481	Rossini	Wilhelm Tell, Ouverture		1914
491	Rubinstein	Kammenoi ostrow, op. 10, No. 22	Franz?	1921
500	Wieniawski	Valse De Concert op. 3	Franz	
502	Schubert	Am Meer, Lied	Franz	1912
504	Schubert	Lindenbaum, arr. Fr. Franz	Franz	1925
516	Schumann	Träumerei aus Kinderszenen, op. 15, No. 7	Franz	1912
518	Schumann	Schlummerlied	Franz	
536	Suppé	Dichter und Bauer, Ouverture	Franz	
539	Suppé	Die schöne Galathé, Ouverture	Franz	
562	Massenet	Thais, Meditation	Franz	
589	Verdi	La Traviata, Selektion	Franz	1927
591	Verdi	Rigoletto, Potpourri	Franz	1916
595	Verdi	Troubadour, Potpourri		1922
636	Wagner	Tannhäuser – Overture	Welte M.	1925
638	Wagner	Tannhäuser – March	Welte M.	
639	Wagner	Lohengrin – Prelude	Welte M.	1923
642	Wagner	Lohengrin (IV <sup>th</sup> Selection)	Welte M.	1914
643	Wagner	Rienzi – Overture	Welte M.	
644	Wagner	Rienzi – Chor der Friedensboten	Welte M.	1913
645	Wagner	Fliegender Holländer, Selektion	Franz	1921
648	Wagner	Götterdämmerung: Trauermarsch		1914
654	Wagner	Lohengrin: Introduction	Franz	
658	Wagner	Meistersinger, By the Peaceful Hearth	Franz	
721	Godard	Berceuse de Jocelyn	Franz	
762	Dubois	Cantilène nuptiale	Franz	1924
788	Wagner	Rheingold, Einzug der Götter in Walhall	Franz	1925
793	Wagner	Tannhäuser, Einleitung zum 3. Akt, Tannhäuser's Pilgerfahrt	Franz	1914
797	Puccini	Tosca, Selektion	Franz	1921
801	Wagner	Meistersinger v. Nürnberg: (excerpts)		1922
932	Beethoven	Symphonie Eroica IV. Satz		1921
943	?	Rokoko Liebeslied		
950	Mendelssohn	Auf Flügeln des Gesangs		1922
955	Beethoven	Symphonie Pastorale, 4. Satz		1922
1092*	Mozart	Pastorale variée	Franz	1922
1134	Rachmaninoff	Melodie, E dur, arr. Lemare		

Once a “global database” of all Welte’s significant roll types is assembled, more detailed comparisons might be made between the surviving media – piano, organ and orchestrion in particular. This should enable closer analysis than is currently possible.

## Time spans and production summaries

Before proceeding, it will be useful to make a survey of events.

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**1880s** By late 1880s Welte were in the final stages of developing their “Style 10 Cottage” Orchestrion. This was a magnificent instrument, grander and more complete than any hitherto. It also adopted the paper roll system, a revolution in itself which catapulted the industry into its boom years. Paper-roll driven orchestrions were known before this – experts differ on exact dates, something which may partly reflect a residue of misinformation prevalent in the manufacturing and patenting world at that time.<sup>8</sup> Welte’s largest, “Concert” Orchestrions, had up to 120 tracks of information, the most complete system devised before the Philharmonie. The catalogue of “120” rolls commanded respect, not only for its quantity, but because so much good classical music was preserved on them. Only one instrument remains in the world today on which “Style 10 Cottage” rolls can be still be played pneumatically: the Salomon Centre Welte at Tunbridge Wells in England.<sup>9</sup> Seewen also possesses much of the orchestrion rolls in two forms: around 300 rolls in their own right and about half that number in Philharmonie rolls that were converted to 150-hole standards.

These orchestrion rolls include much music of a lighter kind, but there is a core of Symphonic, Operatic and Orchestral music with the familiar list of composers: Beethoven, Bellini, Berlioz, Brahms, Delibes, Donizetti, Dvorak, Gluck, Gounod, Grieg, Léhar (Lehár), Leoncavallo, Mascagni, Massenet, Mendelssohn, Meyerbeer, Mozart, Offenbach, Puccini, Rossini, Saint-Saëns, Schubert, Suppé, Tchaikowsky, Verdi, Wagner, Weber. The converted 150-note master rolls were mostly made from 120 rolls. They appear in the Philharmonie catalogues, all essential details duplicated.

Just when the original orchestrion rolls were made is not yet clear. Nor is it clear just how exact the transfer was or how it was done. So far they show some close similarities.

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**1909** a recording organ was first built in Welte’s Freiburg studios.<sup>10</sup>

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**1910/11** early trial recordings were made, many rolls were offered later in Welte’s catalogues.

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**1911** the Philharmonie was publicly unveiled at the Turin exhibition.

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**1912** the first recordings of major European organists were made by Welte in Freiburg:  
July, 18: Marco Enrico Bossi (I)  
September, 9: Alfred Sittard (D), 16 Franz Josef Breitenbach (CH), 30 Marie-Joseph Erb (Alsace)  
November, 26: Eugène Gigout (F)  
Welte initially offered at least 20 roll titles for sale and use on their Philharmonie. The selection embraced hand-perforated rolls and a few newly-recorded organist performances (not all rolls are dated, so these figures can only take into account those that are).

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**1913** Welte consolidated their organ designs, including modifications to their recording organ and specifications (stop-lists) possibly on advice from Edwin Lemare.<sup>11</sup>  
The second and third scheduled recording blocks of organists were made:  
February, 6: Joseph Bonnet (F), 20 Harry Goss-Custard (GB)  
July, 8: Samuel Atkinson Baldwin (USA), 14 William Faulkes (GB), 26 Max Reger (D)  
August, 28: Alfred Hollins (GB)  
September, 2: Edwin H. Lemare (GB/USA), 15 Herbert Walton (GB), 26 William Wolstenholme (GB)  
Welte offered at least 143 new roll titles for sale in 1913 for use on their Philharmonie, a mixture of hand-perforated rolls and recorded organist performances. Other organists not listed seem to have made recordings in 1913 apart from the above “official” artists.

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**1914** At least 153 roll titles were by now available.

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**1915** A further 25 roll titles were offered in 1915. At this stage the production of rolls began to run a somewhat erratic course, affected by War. After recovery in the early 1920s it went into a final decline after 1926 along with the sales of the instrument. Significantly, the first organ recordings using the new “electrical” system on “78s” were then becoming available.



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Numbers of known new roll-titles added to the catalogue:

1916 : 29	1920 : 23	1924 : 57	1928 : 19
1917 : 17	1921 : 128	1925 : 57	1929 : 10
1918 : 1	1922 : 95	1926 : 146	
1919 : 14	1923 : 24	1927 : 43	

An isolated last roll or two was issued in the 1930s, sometimes serving political ends, mainly made by Otto Dunkelberg and Kurt Binninger with a mixed Germanic repertoire including national songs, Böhm, Bach and Reger.

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## Welte's organ roll production process

With so little remaining of what was one of the world's most closely-guarded industrial secrets – too successfully guarded it now seems – there are dark patches everywhere for anybody trying to establish just how Welte went about making their recordings. Complexity in anything man-made, no matter how ingenious, is lamentably also prone to problems. These are usually in direct proportion: the more complex, the more fault-prone. A paper roll recording system is a chain of events including many stages between original performance and playback. Guarantees of absolute fidelity to an original performance are risky: if taken from the completion of editing they are safer.

The first process applied to the recording was an interpretation of the smudgy, meandering, broken ink-marks left on the paper by the recording machine. The second was a thoroughly worked-through revision. After errors had been eliminated in what became the second master rolls, commercial copies were made from them or a “production roll” if one existed.

With century-old paper as the recording and playback medium, even climatic conditions can compound these problems. A wrong, missing, or corrupted note, or an irrational registration could be the organist, the recording organ, the recording machine, any of a number of editing processes, the “sewing machine” (see later), the copying perforator, roll deterioration, humidity, a tear in the paper, a scanning problem, a software glitch, a MIDI overload, a problem in the player-organ itself or some other quirk that can beset this technology at every stage along its long, meandering path between performance and playback.

But the treasure here is so valuable that the hunt for it is worth the perseverance. Fortunately many checks and balances are available and the end result can come very close to the intentions of the artist. So the scholar analyzing these performances hoping to glean microscopic detail may well be advised not to hone single events down to precise microseconds.

Or the student hoping to emulate a performance might be advised not to try to copy it too slavishly. Playing the pedal before the manuals is demonstrably questionable; holding it afterwards does happen, but this is found in less than 50 % of the performances.

Welte and their artists were very conscious that they were the first to be able to preserve their otherwise ephemeral musical culture in this way for posterity. The reception of these recordings was enthusiastic, almost ecstatic. These people believed unshakably in the value of their culture, so they took great trouble to see that it was well-represented through their amazing new technology. Most pianists devoted time and patience to stay on and edit their recordings to perfection. Certainly some organists did, too. All of them said publicly that no greater perfection could be attained. Few other recordings pre-1950s will ever be reproduced as well as these century-old paper-rolls. For one thing they are played back on a real musical instrument by long-dead artists who seem through this medium to be performing “live” for us.

So – as in any photograph – while trees might not have all the sub-atomic detail of a living plant, the forest that they constitute is totally accurate. Look too closely at a digital photo and pixellation results; yet the big picture is unmistakably there.

## Recording and “First Master”

The basic procedure in Welte organist recordings commenced as the piece was played on the recording organ at their Freiburg or New York studio. (There were no female organists involved and no other venues). The notes were marked on the “first master” roll, through lines drawn on it by the recorder as the performance took place. A communication from Nelson Barden reporting on the operation of this machine included: “... the little wheels were about 3/16” from the paper. At that point, the paper is passing over a thin hardwood strip ... the wheel action was very fast and made a snapping noise.”

The starts and stops, continuity or even the linear course left by these little inked “wheels” left something to be desired, but could be accurately interpreted and transformed by technicians later. Hans Schmitz’s analysis of the Seewen recorder revealed many vagaries in the recording processes – e.g. some small compromises in the operation of the “little wheels” (see his article in German elsewhere in this publication). As our first masters clearly attest, this meant the beginnings of notes overlapping the ends of previous ones. Some lines were rather less than straight, some non-continuous or not contained in or on the basic lines which were pre-marked on the paper.

But the Welte technicians knew their metier and could pin-point these things. They drew lines and arrows clarifying the beginnings and ends of notes, crossed out errors and otherwise laboriously prepared them for perforation. What resulted was as near to a perfect representation of the artist’s wishes as was possible. It gave a total control allowing registration changes to be timed exactly, legatos honed, and even the sequence on a pre-set crescendo pedal to be tweaked or altered at will.

Alfred Hollins gives a most revealing description of the recording process in his memoirs. (Buchali was a Welte employee; he was also, along with Franz, a member of the Freiburg City Orchestra, although Buchali began there much later on 15<sup>th</sup> Dec 1903; he retired in 1935 and died 17<sup>th</sup> Sep 1962 at Weil am Rhein).<sup>12</sup>

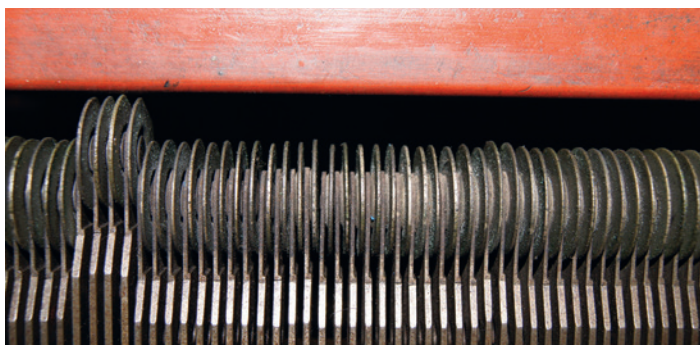


Fig. 6 – The marker-wheels of the recorder



Fig. 7 – Markings on a “first master” roll

#### Excerpted from “A Blind Musician Looks Back” (Alfred Hollins)

Bockisch had asked me to bring a copy of every piece I intended to record, and this I had done. The first two days I spent playing over my intended records, and Buchali beside me marking in the copy whatever combination of stops I selected. When I began recording he still sat beside me and followed the music closely. Every morning Bockisch asked me to play a chromatic scale two or three times up and down each manual as fast as my fingers could go, so as to make sure that the markers were working freely after having stood idle all night. When I had played my scales like a good boy, Buchali used to take my hand in his big soft paw and say: “Ach! Well done! Those nice warm fingers!”. We worked every day from ten till about one and from half-past two until half-past five, with a break at four, when tea and dainty little cakes were brought in. ... Bockisch wanted me to hear one of my rolls before I left, and it was arranged that I should take the day off while Buchali got one ready... Herr Welte, the founder and head of the firm, a fine example of old age, often came into the studio while I was recording. ... In the studio there was a charming little organ – without keyboard – on which rolls were played. One of the stops was an open wood flute known as a Vienna Flute [Wienerflöte], and when I told Herr Welte how much I liked it he opened out at once. Before developing the Welte-Mignon and the organ-player, the firm’s main business had been – and to an extent was still – the building of orchestrions for the use with roundabouts and shows at fairs. Bockisch let me hear one of these instruments. It was wonderfully realistic, but what a dreadful noise it made inside the building! ... I left all my music so that the records could be checked and corrected before the rolls were made. When war was declared it had not been returned, and this was not surprising seeing that to go over my fifty alone would take a long time, and Buchali had a large number made by other people to examine also.



Five “first masters” have survived unperforated in Seewen. From them there is only limited information to be gleaned. Only the notes played on Manual II and Manual I (with pedal undifferentiated in the lowest 30 notes) are recorded. They all exhibit paper which does not align exactly with the 150-hole standards of Welte so perhaps they were faulty. Unfortunately the sampling of a mere 5 rolls is too small. They are short rolls of uncomplicated music, apparently played by “Frey”, about whom nothing is known. None of them exist as second masters enabling comparisons – partly because second masters are mostly the same rolls after they have been perforated.

There was a pianist, Herbert Fryer (1877–1957), who recorded Dvorak’s Humoreske which was turned into an organ roll, Welte No. 138, but this is highly tenuous and no other connection has yet been found. One point of interest is that there is clearly a performer’s mistake at the start of one of them, and a restart is made, apparently correctly. The erroneous entry has been pencilled out. Such a procedure is highly unlikely to have had its origins in an already “perfected” piano performance. It is

entirely possible that they were early test recordings – the known three Welte Nos., 85, 89, 245 strongly suggest this – and that pedal, swell and stops were not manipulated.

All other viable first masters have notes, stops and swell manipulations recorded on them.

## The “Second Master”

The “second masters”, seem to have been the first after editing and perforation took place. The recorder made its markings in black ink, which is quite distinct from the 150 sometimes red, mostly gray lines drawn as guidelines on the blank rolls. A skilled editor laboriously located and corrected every note, stop and other function through pencil marks on the roll, then, what later became colloquially known in the US as a “sewing machine”, perforated it. Thus the “second master” was born. This is probably what the lady at bottom right is doing in the photo.

After that there only remained the pedal advance and its pilots to be perforated in – aided by the music which the artists had to leave behind. Here, as



*Fig. 8 – The “sewing machine” – far right, front*



elsewhere, adjustments and corrections were made e.g. by adding additional length to a note, through extending its perforations, or cutting it shorter by pasting normally red or yellow stickers over any undesired perforations. At this stage a few mechanical functions such as roll centering lines and rewind signals were also perforated in. Second masters thus culminated in a motley collection of stickers, graphite or coloured pencilled notes, ruled lines and perforations.

Sometimes “production masters” are mentioned in this context. If this happened at all they would have acted as the final master from which the commercial copies were made. Seewen possesses some second masters that have no editing marks on them and appear to be master-copies. It is possible this was either a further production stage, thus they are possibly “production masters”. However there are extremely few of them. It is possible – even probable given the fragility of some of the second masters – that an occasional re-mastering had to be done. Beyond that at the moment it is mostly speculative: solid evidence is needed.

## The perforations and their differing functions

Each of the various actions used in the Philharmonie employs a different system: notes, stops and swell expression are the main three. Other operational systems were used for rewinding, multiplexing, roll-centering and “pedal advance” facilities.

The notes were simply a pneumatic command to “play”, created when the perforations for a particular note began, and “stop” when they ceased.

The stops received a single short marking (a short string of perforations) when they came on for the first time. Subsequent markings on the same channel toggled them to the opposite function. This worked well as long as the system was not disturbed by an air leak, puncture in the paper or similar pneumatic misadventure – at that point the system would toggle, but reverse the intended stop action from then onwards.

For recording swell expression Welte used five lines on the roll (centre and 2 either side) to indicate at least 7 positions of the swell (4 can convince the ear). These were directly marked onto the master roll at the time of recording, based on the swell-pedal’s position. From the gradients these 5 lines represented, the necessary perforations were later calculated, marked in and perforated. This played back through impulses controlling speed and direction of shutter movement according to a mix of

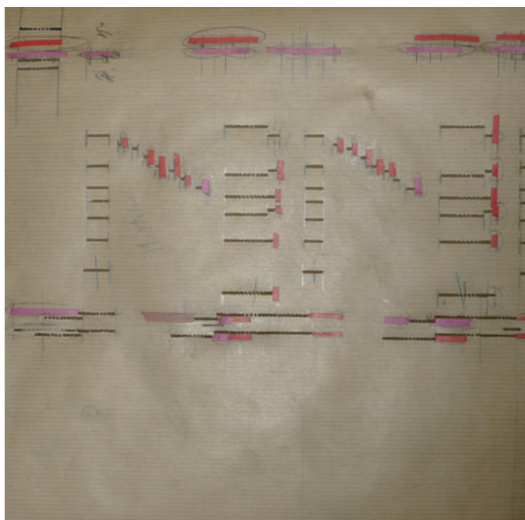


Fig. 9 – Edited Welte No. 1181, *Lemare's Study in Accents*

fast/slow and open/close, allowing faithful reproduction of the organist’s swell manipulations. The pneumatic technology for this is not regarded as any great problem<sup>13</sup> and possibly derived from Welte’s experience with piano rolls.

The “pedal advance” control was operated according to another system (see later). This was not uncomplicated and prone to a great variety of “standards”: there is at least one known instance where there might have been a mistake in sorting out the pedal and manual lines.

## Welte’s Editing

The second masters were edited – sometimes quite drastically. With pianists this had been done in the presence of the artist but less evidence is available of organists staying on. Certainly Lemare did, and possibly others. In any event Welte’s specialist musical technicians – some of them organists – were fully conversant with the repertoire of their era and its performance paradigms. From what Hollins said, at least one was present during recording and took notes. All of them supposedly approved their recordings so there must have been, as we know there was with Hollins, some opportunity for them to hear their recordings played back.

It is known that pianists typically spent days editing their roll performances, and some organists did, too. Lemare dwelt long at Freiburg – or returned – as the evidence shows him almost continuously there through 1913. But he apparently had other functions to play for Welte: Binniger reports that he also influenced the design of their

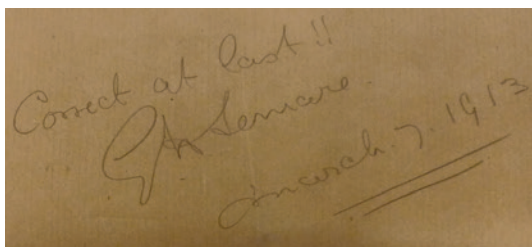


Fig. 10 – Written on the lead-in to Welte No. 1181 (Lemare Study in Accents)

organs.<sup>14</sup> Other organists were less careful than Lemare in reviewing their own recordings – Reger was notably negligent. Others, like Messner – or his editor – may have confused the Vox Humana stop with the Vox Humana Echo box control. Other errors seem to be occasionally uncorrected, but they are few.

The second master rolls also came to bear much additional information: sometimes the edition used, roll-editors' names, review dates and (often later added) “selling” features of the registration used (such as Vox Humana, Glocken or Tutti). Transfer indications from Piano or Orchestrion rolls to Philharmonie have already been mentioned. “Echo” identifies rolls suitable for organs, such as that at Tunbridge Wells, which has a third, Echo division.

A major review of Welte's rolls was undertaken between about 1923 and 1925 where many were adjusted and their details noted and dated on the lead-ins: jottings such as “pedal regulated” appear, a correction of their problematic pedal-advance technology. This had commercial implications now that the firm had found out what “sold” and what did not and Organ Reform promoting an antithetical organ type to Welte's was looming. It is also significant that these dates lie between the two Freiburg conferences of 1922<sup>15</sup> and 1926.<sup>16</sup> The market was contracting for the second time in a decade (World War I was the first), so this was presumably an effort to apply correctives, prolong the life of their product, stay in business and beat the competition.<sup>17</sup>

The second master sometimes has the artist's signature as a kind of endorsement. In one famous instance, Lemare's “Study in accents” (Welte Nr. 1181), a nightmare recording with swells, notes, stops and pedal all needing precision accuracy, the signature is accompanied by Lemare's weary, three-word outburst: “correct at last!!”.

But the end result was a second master brought as near to perfection as possible. Masters use a brown paper stock. With all their editorial comments, stickers, additional, or covered-up perforations, they are a delicate commodity. Playing them pneumatically is neither advisable, nor was it intended. Their fragility risks damage, even destruction, from running them through and rewinding them on the player. So scanning and digitization is more reliable and a conservation measure. The green copies made from them can still be played pneumatically.

## Commercial roll-copying

The second masters were used to make multiple copies which were the end-product offered to Welte's clients. They were turned out on a “perforator”, the frame and tractor feed of which are shown opposite.

They sold for between 12 and 70 Reichs Marks each – today that approximates to a range of around 42–250 Swiss Franks. They were far more expensive than the modern CD, to say nothing of the cost of the equipment needed to play them.

## Bigger and better

Aggrandizement of organs and orchestrions continued, even with the Philharmonie. Already before 1917 US instruments ran to 3 manuals and sometimes, as at Tunbridge Wells, pedals, 2 manuals



Fig. 11 – Paper tractor for making the commercial roll copies

and 3 manual divisions. Seewen's Britannic organ was also considerably enlarged and its multiplexing adapted between 1920 and 1937. A few rolls originally recorded for the standard Philharmonie were later worked over and re-issued by Welte to suit these larger models. They are numbered in the 4000s and appear to have been selected for their popularity – either the organist, the music or both. Most of them are dated, those that are all bear 1926. These re-releases account for about 2.8% of all known rolls. Where an artist's rolls have been re-released in this manner it is indicated in the relevant tables given in the second article in this publication: "Pearls and rarities of the Welte roll collection".

## Digital editing of the scanned rolls at Seewen

With the restoration of Seewen's Britannic organ in 2007 the long process of digitizing the associated rolls and producing the first CD recordings was begun. In mid-2011 a collaboration was launched with the OehmsClassics company of Munich which should eventually publish as many of these unique historic performances as possible. The volume of material and preparation of it will take time.

The first task in preparation for CD recording is to check and ensure the scans are accurate and have been interpreted correctly. Then follows a virtually note-by-note and stop-by-stop check. Finally the pedal needs to be restored to its proper point of playing.

The scanning of a roll completed, both a custom-made ".mid" (MIDI-file format) and a ".rec" (special file format to drive the Seewen organ) are produced. A "tools.exe" program converts between the two of these formats at will, offering some checks and balances as well as other manipulations. There are a number of commercial programs available for editing MIDI files. With them the digitized data can be made to appear as a "piano roll", with four organ tracks differentiated by colour-coding: Manual I (green), Manual II (pink), Pedal (blue) and registration (yellow).

This can then be manipulated, saved, and re-converted to a ".rec" file. The illustration shows the screen view with keyboard at left, pink lines of the second manual, the green of Manual I coupled to pedal (blue) just showing through. The amount of overlap here with the pedal is not audible, but the pedal and Manual I were both "advanced" by Welte and this is. The top four (broken) yellow lines are the swell controls and under these are the registra-

tions converted from the toggle system to one identical with the keys – line on = stop on, line off = stop off. Clicking on the yellow lines gives a read-out of stops rather than the keyboard shown at the left which appears when editing the notes.

## Keys: missing notes, added notes, fragmented notes

The manual key- and pedal-strokes are generally a reliably-marked aspect on Welte roll-recordings. One problem in pneumatic playback or roll-scanning is that a manual can get transposed and play a semitone out from what was intended. This happens when the paper is warped, torn, shrunk, crinkled or has otherwise not survived in good condition. The problem is usually immediately evident, clearly an error that neither the organist nor Welte could ever have accepted. In itself it is easily fixed, but it is also a harbinger of trouble for stops and other controls so, when it occurs, much more than the notes need double-checking.

Sometimes in the scanning process, folds or similar irregularities in the 100-year-old paper will obscure perforations as light passes through the beam between source and camera, and no note will be detected, or only part of one. This is more difficult to detect but there are checks and balances that help – such as when manuals or pedals are coupled together, but one of the notes seems to come and go "irrationally". This is again relatively rare, although if it happens once in a particular roll it is likely to happen again. Audition in most cases detects the obvious. Visual checking and, if needed, digital correction then follow.

Four images illustrate a useful technique developed to help clean up performances. The first image ("Before") shows the file as it comes from the scanner: Pedal and Manual I advanced (lowest green line) and some pink (Manual II) just showing through where notes are not absolutely together. This latter is of little consequence, since it is all within the tolerances of the entire system and human perception. But the Pedal and Manual I advance represents about a quaver or semiquaver at crotchet 60 and is disturbing (the vertical hair line shows where the lowest green line and the blue behind it should start).

The second image ("transposed") shows a temporarily transposed Manual I (up a semitone) and Pedal (down a semitone). This gives a three-decker image for each note and an unbelievable cacophony if played. Anything untoward becomes very obvious. It also allows a quick and sure-footed realignment of

The manual key- and pedal-strokes are generally a reliably-marked aspect on Welte roll-recordings. One problem in pneumatic playback or roll-scanning is that a manual can get transposed and play a semitone out from what was intended.



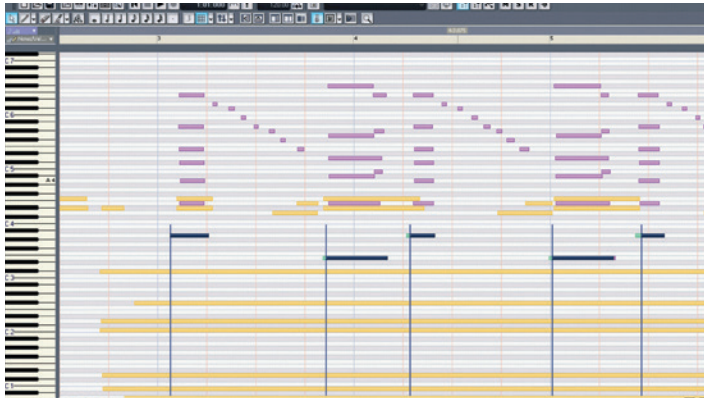


Fig. 12 – Part of Lemare's Opus 64 shown on a Sonar 6 screen

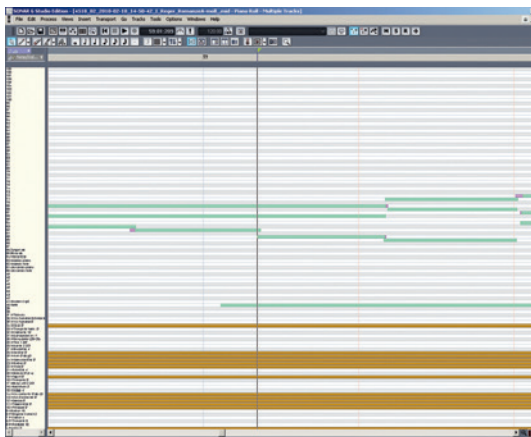


Fig. 13 – Before

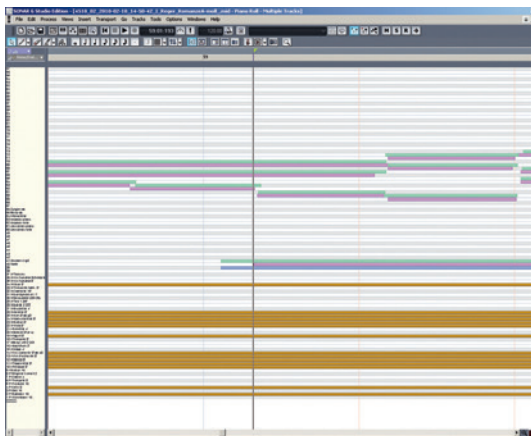


Fig. 14 – Transposed

Pedal and Manual notes where, as here, a coupled Manual II shows the original points of playing. It is clear how Manual I and Pedal have been moved forward of Manual II (pink).

In another example (not shown) a broken up 16' pedal under an identical manual part can be detected through passages where bass notes or parts of them are missing. A degree of caution is needed in this situation, since sometimes not every pedal note is played. An edition might be a help, if available, but that presupposes the organist used it, and took no liberties – or did not simply miss a pedal note, accidentally or intentionally.

The third image ("Fixed") shows corrections done, most importantly the Pedal returned to the point at which the organist originally played it. As can also be seen here, subtlety of phrasing and similar detail is usually well-preserved and, if left alone, presents few problems once the notes themselves are sorted out. Fortunately difficulties with the technology representing this and other phrasing practices are not often encountered. When they are it is sometimes necessary to fall back on the forest and overlook detail in the trees which is not available. Intervention, except for the pedal, mostly seems unwise and is rarely undertaken.

The fourth image ("after") shows the transpositions undone, with manual and pedals returned to their correct pitches. The file is then converted back to a ".rec" format for playing on the organ.

Another problem can also be fragmented notes: these often occur with damaged masters. A long note simply stops and starts again, generally several times, and without apparent reason when all other notes alongside it are continuous (as e.g. in chords). There are, however, traps to avoid here, as a chain of repeated notes is indeed sometimes clearly intended to sound against the longer, continuous ones.<sup>18</sup>

## Stops: stop reverses

The Welte toggle system for stops is a great potential trouble-maker. If a toggle is made where none should be, then the registration gets reversed. Some manifestations of this can be dramatically evident, e.g. the Posaune 16 playing a bass under an extremely soft Aeoline on Manual II, is something of a give-away. Then the Posaune will probably be absent from the next Tutti where it is usually needed. In hand-perforated rolls Welte often add a stop for a moment to boost a sforzato – which can be a nightmare if one gets reversed. A clue to stop reversals is when Welte's automatic stop-cancel at the end of each roll brings stops on that clearly should already have been on. Caution is still needed: if the toggle impulses trigger multiple times wrongly the stop might even appear to cancel normally.

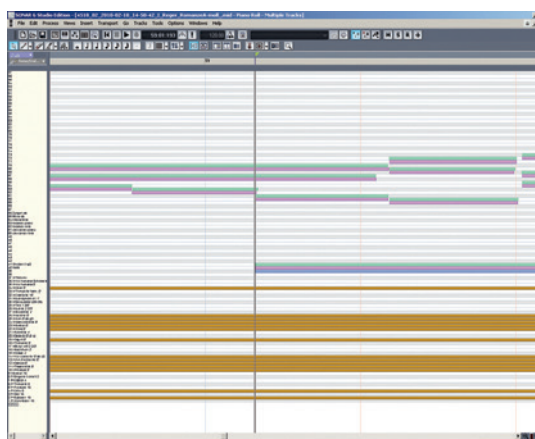


Fig. 15 – Fixed

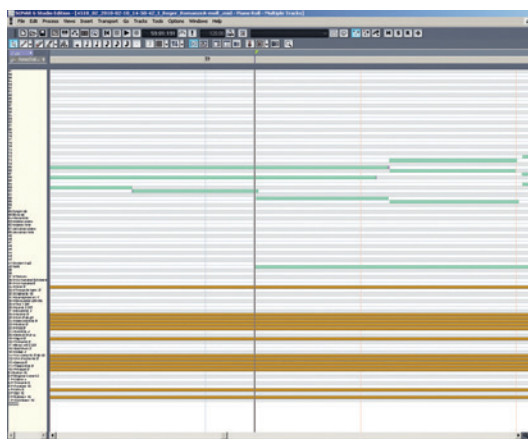


Fig. 16 – After

One instance occurred early in 2011 when a tiny flaw in a master-roll's paper signaled a stop-toggle, making a mockery of the music following. The master rolls' brown paper is far more fragile than the more robust green copies. Only some scans of Master-rolls play more accurately. Where both master and copy exist it is necessary to see which one has survived best. Comparisons can be very useful if duplicate rolls exist.

Sometimes the swell commands inadvertently trip the Manual 16' Bourdon to "on" – a stop not even present on the original recording organ. It can have validity in rolls made after the revisions of 1923–1926. Simultaneous "swell open and swell closed" (conflicting) signals with Welte's multiplexing, is used to bring on this stop – it is not fully fail-safe technology.

## Swell expression

Welte's Swell control was recorded on a series of 4 tracks on the Philharmonie rolls just to either side of the centering track. As such, they are in the least vulnerable place and rarely give problems. Even if they malfunction, the Welte system automatically resets to "o" whenever an extremity is reached.

## Restitution of the pedal advance

Notes, swells and stops mostly create only relatively minor or infrequently-encountered problems. Not so, the pedal advance. This is a deliberate Welte manipulation which disturbs the original performance and exists in almost all rolls. The technology employed by Welte for this feature was inconsistent and frequently tweaked over two decades. A laudable solution but an audible fault, it under-

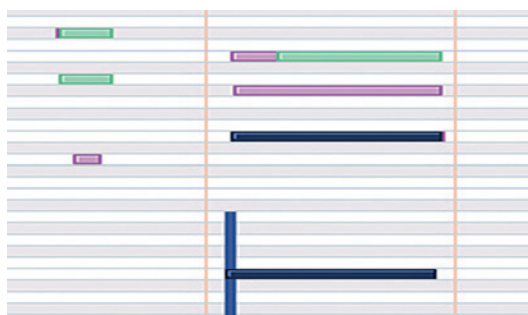


Fig. 17 – Blue = Pedal; Pink = Manual II; Green = Manual I

mines both the enjoyment and historical value of these performances if not corrected.

Welte's system used 2 control tracks at the roll's edge to determine what happened to the lowest 30 notes of Manual I and Pedal. These 30 notes were shared in pedal and manual. The multiplexing sorted this out: the lowest note on the roll either played on the Pedal alone, Manual I alone, or both together. The correct permutation was "piloted" by the two tracks at the edge of the roll. However this meant that the start of the relevant note had to be moved forward so that the control operated only on it, and not on all of the lowest 30 notes played at that moment. The end of this note could also be adjusted to "make way" for the following note. This, of course, doubly distorted and corrupted the organists' apparent co-ordination. Welte were openly criticized for this and clearly experimented with it. Editors, particularly in the early stages, took very varied approaches. Some even seem to have had lapses of attention and missed advancing a few notes. In the mid-1920s, at least one major modification seems to have given the impression of improvement by letting the pedal occur on time,

but delaying any Manual I notes affected. It was all expediency, but can now be corrected digitally.

For the modern editor attempting to revert to the original attack and release of the pedal notes there are still difficulties. However, if the pedal is coupled to Manual II (see above) then the same note would naturally show up there, too. Manual II was not part of the Pedal multiplexing system, so it showed the original points of attack and release.<sup>19</sup>

As with all matters pertaining to roll-recorded performances, the individual trees may or may not enjoy absolute precision, but the integrity of the forest does remain intact.

One early approach was to try and make this automatically corrected by simply entering a pedal delay value in milliseconds. However the assumptions that this was always the same, even within the one roll, turned out to be almost amusingly erroneous. It was soon evident that it retarded the pedal but not the other parts that were (sometimes) shifted (forwards or backwards) with (or against) the pedal. It was a far more complex reality, and too open-ended, to be resolved so simply. Thoughts of writing a dedicated software program were defeated by the chaotic Welte system which approached whimsicality: it could vary from roll to roll, piece to piece, technician to technician, day to day or from one chord to the next.

Daniel Debrunner – technical expert for the project (see his German language article in this publication) – eventually advised that this was a job that only humans could do, not computers. It meant a labour-intensive future where none had been foreseen, note-by-note re-editing everything “in reverse” to Welte’s technicians of 100 years earlier, but it also showed some of the control available from this system. Special skills, musical knowledge, experience and reserves of patience, are the only way known at present to edit this.

Some rolls – for example Gigout’s roll of Lemmens’ Fanfare, re-released for a larger organ type around 1926 (pictured) – show not a single pedal note advanced. Closer inspection reveals that in this case Welte had taken their second approach: instead of advancing the pedal they retarded the manual notes above the pedal, as seen here. Thus, in working on this aspect of re-editing these old rolls the editor must recognize and contend with a system which was in a constant state of flux.

It is sometimes necessary to make decisions where no guidelines are available. Whether the end result reflects what the organist actually did may well need to be conjectural in some instances. The more experience gained in editing, the more likely it will be that decisions are correct. It is here that the “wood and trees” analogy is most apt: whilst, for example, the precise length in milliseconds of a note can be measured, it cannot be guar-

anteed that all processes have maintained such accuracy. The tolerances in the entire system from recording procedures to the organ’s action just do not allow that.

## Playback – “digital forensics”

There is a gold mine of historic performance practice information to be gleaned from these rolls.<sup>20</sup> For the organist, registration is one highly important aspect. Sometimes the procrustean situations with which the editor is confronted point to problems which might otherwise be missed. So, for example, a situation often occurs when Manual I is registered with Vox Coelestis alone. Organists’ registration practice now mostly eschews this, but Welte rolls show that it was quite common. Some traditions – e.g. in the US – allowed for automatic drawing of two ranks when the Coelestis was drawn, but this is clearly not the case here. There are no pipes, and hence no sound, in this lowest octave (normal practice). When a roll tries to “play” these absent notes it can yield wrong inversions of chords, momentarily lack a bass line, or create some similar musically-questionable situation. Yet Welte knew what they were doing, and can hardly have overlooked a matter as basic as this. So, when it happens, it is an important alert to the editor to check if the pedal should be playing or not. In most instances investigated so far the pedal should be playing, usually with the Subbass 16’ stop alone. Which is another performance practice lesson for many modern organists who might draw another stop to “clarify” the low, almost indeterminate pitches in this lowest octave.<sup>21</sup>

As with all matters pertaining to roll-recorded performances, the individual trees may or may not enjoy absolute precision, but the integrity of the forest does remain intact.



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- 1 Richard C. Simonton, “Die abenteuerliche Suche nach den Schätzen des Herrn Welte – Ein Augenzeugenbericht von 1948”, in: Gerhard Dangel, *Automatische Musikinstrumente – Aus Freiburg in die Welt – 100 Jahre Welte-Mignon*, Freiburg im Breisgau 2005, S. 14ff. (German translation of the English original draft used here as source). Simonton gives the technical term as “designed roll”. Others use “graph paper rolls”; “drawn rolls”; “hand-played rolls”; “drawn by hand”.
  - 2 Paper rolls had already been patented by 1842. In 1847 Alexander Bain described a device using a paper roll as a “travelling valve” controlling airflow through a reed-organ’s reeds.
  - 3 For a database of Seewen’s rolls see [www.musikautomaten.ch](http://www.musikautomaten.ch) or [www.davidrumsey.ch](http://www.davidrumsey.ch).
  - 4 Hans-W. Schmitz, July 1, 2011, amongst others, sees the process as essentially simple, for example playing the roll over a tracker bar, converting the pneumatic signals electrically, and then patching them to the desired alternative tracks on the new roll.
  - 5 Gerhard Dangel, June 2011.
  - 6 Marie Dominique Joseph Engramelle, *La Tonotechnie, ou l’art de noter des cylindres dans les instruments de concerts mécaniques*, Paris 1775.
  - 7 Bruce Haynes, *The End of Early Music – A Period Performer’s History of Music for the Twenty-First Century*, Oxford 2007.
  - 8 Nelson Barden, June 17, 2011.
  - 9 A CD of the Welte Philharmonie at Tunbridge Wells is now available, produced by the Royal Academy of Music. Some orchestrion tracks are included.
  - 10 Welte had been working on this for some time. In a letter to Richard C. Simonton dated 10<sup>th</sup> August 1947, Edwin Welte wrote: “We began now to drop the orchestrion and built the Philharmonic organ with recorded artist rolls 1904/5”. (Archives of the Augustinermuseum Freiburg).
  - 11 Kurt Binninger, “Die Welte-Philharmonie-Organ”, in: *Acta Organologica*, Vol. 19 (1987), p. 179 – 208.
  - 12 Information conveyed by Gerhard Dangel, June 28, 2011.
  - 13 Nelson Barden, June 28, 2011.
  - 14 Kurt Binninger *op. cit.*
  - 15 “Orgeltagung in Freiburg” (1922) – centered around the “Praetorius” organ in Freiburg University Hall built by Walcker with Wilibald Gurlitt consultant.
  - 16 The “Orgeltagung in Freiburg” held in the summer of 1926, again led by Wilibald Gurlitt, is generally regarded as the “declaration” of the Organ Reform Movement.
  - 17 Nelson Barden, June 24, 2011: Significantly, perhaps, as Barden reported, Aeolian had started recording DuoArt organ rolls in 1917.
  - 18 The performance by Lemare of the Ruy Blas overture by Mendelssohn (Welte No. 1241) contains both of these faults and many potential traps, partly due to the clever playing of the organist.
  - 19 This was a device used earlier by Nelson Barden in editing pneumatic rolls of Lemare.
  - 20 e.g. some important performance paradigms are discussed in: David Rumsey, “Welte’s Philharmonie roll recordings 1910 – 1928: My afternoons with Eugène Gigout”, in: *The Diapason*, March 2011, pp. 25 – 33.
  - 21 Such was the case with the master roll Welte No. 213 of Grieg’s Peer Gynt which suffered badly from ageing paper problems.
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## ABSTRACT

### The big picture – Welte’s instruments, rolls, recording, digital editing

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Welte’s objective to record live organ performances – after their noted successes with piano recordings – followed as a natural consequence, and much effort was put into this by the firm in the lead-up to its full introduction around 1911.

Live recordings were scarce in the early days of the Philharmonie, so Welte stopped this gap by taking many of their most popular orchestrion titles and reworking them to suit the instrument’s new resources and better technology. These orchestrion-derived rolls can be remarkably effective in making “mechanical performances” sound convincingly musical. The question of performance practices of the era being reflected in those made by “M. Welte” and “Fr. Franz”, actively involved from about 1880–1915 is raised. The discussion suggests that they could be of importance in the investigation of performance paradigms pre-World War I.

A summary of time-spans and roll-production details then gives an overview of the foregoing from about the 1880s to the 1930s.

Welte’s recording of organists is next investigated. The technology was a well-kept secret, but a possible sequence is here proposed based on surviving evidence. This moves through the physical recording procedures, first and second master-rolls, to the “perfected” commercial copy. The Welte Philharmonie roll technology is investigated and details given of their control systems for notes, stops, dynamics and other operations.

Welte’s own editing processes of the master-rolls then comes under scrutiny as they prepared the performances for commercial copying and sale.

Later, “bigger and better” Philharmonies appeared as the evolution of a more or less natural aggrandisement of some models took place.

Finally some problems, tricks and techniques in modern digital editing of scanned rolls is presented. This includes dealing with any errors in notes, stop-controls (especially occasional stop reverses), swell expression, and particularly the restitution of Welte’s “pedal advance” technology to eliminate a technological compromise for which Welte had been criticized. A short addendum to this explains what is described as “digital forensics” used to detect and fix certain other problems that occur.

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## ZUSAMMENFASSUNG

### Überblick – Instrumente, Rollen, Tonaufnahmen, digitale Bearbeitung

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Nach dem weitbeachteten Erfolg mit den Klaviereinspielungen war das nächste Ziel der Firma Welte, Orgelvorträge aufzunehmen, ein logischer Schritt, und die Firma scheute auf dem Weg zur erfolgreichen Markteinführung im Jahre 1911 keine Anstrengungen.

In den Anfängen der Philharmonie-Orgel waren Live-Aufnahmen äusserst selten, ein Umstand, dem man bei Welte Abhilfe zu schaffen versuchte, indem man viele der populärsten Orchestrionstücke an die Möglichkeiten und die verbesserte Technik des neuen Instrumentes anpasste. Diese ursprünglich für das Orchestrion gedachten Rollen vermögen «mechanische Vorführungen» bemerkenswert musikalisch klingen zu lassen. In der Frage nach der Aufführungspraxis jener Ära richtet sich das Augenmerk vor allem auf die Adaptionen von «M. Welte» und «Fr. Franz», die beide zwischen 1880 bis 1915 an der Entwicklung beteiligt waren. Es darf vermutet werden, dass sie sich bei der Erforschung der Aufführungsparadigmen in der Zeit vor dem Ersten Weltkrieg als wichtig erweisen könnten. Schliesslich geben ein Abriss über die verschiedenen Zeiträume und Informationen zur Produktion der Rollen einen Überblick über die Jahre 1880 bis 1930.

Der nächste Punkt befasst sich mit den von Welte gemachten Orgelaufnahmen. Das Verfahren war ein gutgehütetes Geheimnis; basierend auf dem erhalten gebliebenen Material wird hier ein möglicher Ablauf dargestellt. Dieser beginnt mit dem eigentlichen Aufnahmevorgang, gefolgt von der ersten, dann zweiten Mutterrolle, bis hin zum «perfektionierten» Verkaufsexemplar. Die Welte-Rollentechnologie wird untersucht, und die Details des Kontrollsystems für Töne, der Register, der Dynamik und andere Funktionen werden dargestellt.

Anschliessend wird untersucht, wie die Welte-Mutterrollen bearbeitet und für die kommerzielle Verwertung aufbereitet wurden.

In späteren Jahren tauchten als Folge einer mehr oder weniger natürlichen Entwicklung immer grössere und leistungsfähigere Philharmonie-Orgeln auf.

Schliesslich werden einige Schwierigkeiten, Tricks und Techniken beim modernen digitalen Editieren gescannter Rollen aufgezeigt. Dazu gehören die Korrektur von Fehlern bei Tönen, Registersteuerungen, vor allem gelegentliche Registerumkehrungen, Schwellerfunktionen und besonders die Korrektur der Vorverschiebung des Pedaleinsatzes, ein technischer Kompromiss, für den man Welte kritisiert hatte. In einem kurzen Anhang wird beschrieben, wie man mittels «digitaler Forensik» versuchte, weitere Probleme zu erkennen und zu lösen.

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## RÉSUMÉ

### Les grandes lignes – instruments, rouleaux, enregistrements, édition numérique

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Profitant de la dynamique créée par les enregistrements de concerts de piano qui connurent un franc succès, Welte s'est logiquement fixé comme but d'enregistrer des pièces pour orgue jouées en direct. D'ailleurs l'entreprise n'a pas ménagé ses efforts pour atteindre cet objectif qui sera tout à fait opérationnel vers 1911.

Vu la rareté des enregistrements en direct aux tous débuts du Philharmonie, Welte a voulu combler cette lacune en partant de plusieurs de ses plus célèbres titres pour orchestrons et en les retravaillant pour les adapter aux nouvelles ressources et aux progrès technologiques de l'instrument. Ces rouleaux pour orchestrons parviennent de façon étonnante à conférer à des productions «mécaniques» une belle musicalité. La question de la qualité d'exécution de l'époque, telle qu'elle apparaît dans les enregistrements de «M. Welte» et «Fr. Franz», qui y sont considérablement impliqués entre 1880 et 1915, est soulevée. La discussion suggère que ce pourrait être un facteur clé pour l'étude des modèles de référence en matière d'exécution qui prévalent avant la Première Guerre Mondiale. Ensuite, un résumé des périodes et des détails de la production des rouleaux donne une vue d'ensemble de la situation pour la période allant des années 1880 aux années 1930.

Le point suivant s'intéresse aux enregistrements de pièces pour orgues réalisés par Welte. Le secret est resté bien gardé sur la technologie utilisée mais il subsiste quelques indices qui nous permettent d'échafauder une séquence possible. Cela commence par les procédures d'enregistrement physique, les premier et second originaux, et enfin la copie commerciale «perfectionnée». La technologie des rouleaux du Welte Philharmonie est étudiée et des détails sont donnés sur les systèmes de commande relatifs aux notes, aux jeux, aux dynamiques et aux autres opérations.

L'article étudie ensuite les procédés employés par Welte pour la publication des rouleaux au moment de la préparation des interprétations en vue de leur reproduction commerciale et de leur vente.

Plus tard sont apparus des Philharmonies plus grands et plus performants suivant l'évolution vers un agrandissement plus ou moins naturel.

Enfin, certains problèmes, trucs et techniques propres à l'édition numérique moderne des rouleaux numérisés sont présentés. Il s'agit notamment de gérer les erreurs de notes, les commandes de jeux (et tout spécialement les inversions de jeux occasionnelles), l'expression et surtout la restitution de la technologie «d'avancement du pédalier» mise au point par Welte afin de supprimer un compromis technologique qui avait valu des critiques à Welte. Dans un bref addendum il est expliqué ce qui est décrit comme un travail de «recherche scientifique sur le numérique» destiné à détecter et à résoudre d'autres problèmes rencontrés.

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# WIE VON GEISTERHAND

AUS SEEWEN IN DIE WELT

100 JAHRE WELTE-PHILHARMONIE-ORGEL



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